

Notes on the classification and synonymy of gamasid mites parasitic on vertebrates (Acarina: Mesostigmata).*

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In the annual report of the South African Institute for Medical Research for the year 1956 (Johannesburg, 1957, p. 61), it was announced that the Department of Entomology, in collaboration with other institutes, was preparing a check-list of arthropods parasitizing vertebrates in Africa south of the Sahara. During the compilation of this list several questions have arisen concerning the systematics and synonymy of the mesostigmatic mites. The various problems encountered are discussed in the present paper.

1. The classification of the Laelaptidae sensu - Vitzthum 1943.

Vitzthum (1943) characterized the family Laelaptidae in a broad sense and divided it into 13 subfamilies, comprising both parasitic and free-living forms. Zumpt and Patterson (1951) followed Vitzthum's classification, as far as the parasitic mites were concerned, and they have been supported by Evans (1955) who, however, united the subfamily Hypoaspidae with the Laelaptinae and placed the Raillietiinae into the synonymy of the Liponyssinae. Other authors regard some of these laelaptid subfamilies as distinct families. Fonseca (1948), for example, treated the Macronyssidae (= Liponyssidae auct.) as a distinct family, and Baker and Wharton (1952) gave family status to almost all the subfamilies listed by Vitzthum and by Zumpt and Patterson.

There are three reasons favouring the adoption of Vitzthum's concept of the family Laelaptidae. Firstly, it is more suitable for practical purposes to have a family characterized in a broad sense than to have a large number of families each containing only relatively few species. Secondly, studies of the free-living and parasitic Laelaptidae indicate that the members of this family most probably represent a phylogenetic unit. This hypothesis has already been discussed by Zumpt and Patterson (1951). Thirdly, the distinctions made between the different subfamilies, particularly the endo-

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parasitic ones, are rather fine and sometimes artificial. This can be explained by the evolutionary trends suggested below.

In the Laelaptidae s. lat., the change from a free-living to an ectoparasitic and finally to an endoparasitic mode of life is accompanied by a gradual reduction in the sclerotization of the body. The Haemogamasinae and Laelaptinae include, besides true ectoparasites, free-living forms which evidently prey on other invertebrates. Many of these forms are found in the nests of vertebrates, and it is very likely that they may accidentally find their way onto the body of the host where they may feed on hairs, skin scales skin secretions or exuding blood. This kind of ectoparasitic life is led by many species of the genera *Haemogamasus*, *Laelaps* and *Haemolaelaps*. Members of the last-named genus already show a reduction of the body sclerotization as compared with the other two genera.

The Macronyssinae are better adapted to a blood-sucking, ectoparasitic mode of life. In *Macronyssus bacoti*, for instance, the sclerotization of the female body is more reduced. This enables the opisthosoma to become greatly distended during feeding, and the mite is consequently able to take a larger quantity of blood at one time. The chelae have lost their teeth and pilus dentilis and are therefore better suited for penetrating the skin. The highest degree of adaptation is shown by species belonging to the genera *Dermanyssus* and *Allodermanyssus* (subfamily Dermanyssinae) in which the chelicerae form long, piercing stilets, and the female opisthosoma can be even more distended.

From the Macronyssinae, and perhaps also from the Laelaptinae, several evolutionary trends have led to the development of forms which lead an endoparasitic mode of life in the respiratory system of vertebrate hosts, for example, the Entonyssinae, which are confined to the respiratory tract of reptiles, and the Halarachninae, which are restricted to mammals. Fain (1957) assigned all the mesostigmatic mites living in the respiratory system of birds to the Rhinonyssinae. Two of the genera, *Astridiella* Fain and *Ruandanyssus* Fain, still have a well-developed tritosternum, whereas this feature is completely reduced in the remaining Rhinonyssinae. We believe that morphological features should be decisive in the characterization of a systematic group, and therefore propose to transfer *Astridiella* and *Ruandanyssus* to the Macronyssinae. In our opinion, these two genera represent a link between the Macronyssinae and Rhinonyssinae. They still have the general features of the Macronyssinae but have acquired a mode of life which is characteristic of the Rhinonyssinae.

We do not believe that the Entonyssinae, Halarachninae and Rhinonyssinae represent monophylogenetic units, but rather that their endoparasitic mode of life may have evolved several times from different 'roots' amongst the Macronyssinae. *Rallinyssus* Strandtmann and *Larinyssus* Strandtmann, which have toothed chelae, may even have evolved from the Laelaptinae. There is no doubt, however, that they have all evolved from 'roots' within the Laelaptidae s. lat. The ancestors of these three endoparasitic subfamilies evidently found their way into the respiratory system through the nasal openings, presumably as ectoparasitic blood-suckers.

The genus *Raillietia* (subfamily Macronyssinae) represents a 'dead end' in one of the evolutionary trends. These mites have become adapted to a life in the outer ears of bovids where they probably feed on wax and sloughed epidermal cells. They are still to be regarded as ectoparasites.

We assign the laelaptid genera parasitic on vertebrates in the Ethiopian region to the following subfamilies:

Haemogamasinae — Chelae with teeth and a pilus dentilis. Palps 5-segmented. Epistome strikingly protuded, the sides denticulated or fringed. Dorsal plate large and undivided. Tritosternum present, bifid. Sternal plate with many or with only 3 pairs of setae. Genital and anal plates provided with a great number of setae. Peritreme long. — Ectoparasitic on mammals. In the Ethiopian region, represented by the genus

Haemogamasus.

Laelaptinae — Chelae with teeth and a pilus dentilis. Palps 5-segmented. Dorsal plate relatively large, undivided. Tritosternum present, bifid. Sternal plate mostly with 3 pairs of setae, rarely with only two pairs. Genital plate present, with a varying number of hairs. Anal plate with 3 setae. Peritreme long. — Ectoparasitic on all kinds of vertebrates and invertebrates. Many genera contain free-living species. From the Ethiopian region, the following genera parasitic on vertebrates have been recorded:

Andréacarus, *Androlaelaps*, *Davisiella*, *Haemolaelaps*, *Laelaps*, *Mungosicola*, *Ophidilaelaps*, *Radfordilaelaps*, ? *Ugandolaelaps*.

Macronyssinae — Chelae without teeth, pilus dentilis absent. Palps 5-segmented, rarely 4-segmented. Dorsal plate more or less reduced in size, often divided. Tritosternum present, bifid. Sternal plate with 3 or 2 pairs of setae, rarely with only one pair. Genital plate present, mostly only with the basal pair of setae, rarely with more than 2 setae. Anal plate with 3 setae. Peritreme long or reduced in size. — Mostly ectoparasitic on vertebrates, but some are endoparasitic. In the Ethiopian region the following genera are found:

Astridiella, *Chelanyssus*, *Hirstesia*, *Hirstionyssus*, *Macronyssus*, *Manisilaelaps*, *Manitherionyssus*, *Metaspinolaelaps*, *Neospinolaelaps*, *Ophionyssus*, *Pellonyssus*, *Raillietia*, *Ruandanyssus*, *Sauronyssus*, *Spinolaelaps*, *Steatonyssus*.

Dermanyssinae — Chelicerae very long, needle-like and extremely retractable, tips provided with a pair of very minute, teeth-less chelae. Palps 5-segmented. Dorsal plate slightly reduced in size, sometimes a separated opisthosomal plate is present. Tritosternum present, bifid. Sternal plate with 3 or 2 pairs of setae. Peritreme long. — Highly adapted for blood-sucking. Ectoparasitic on mammals and birds. Represented by the genera:

Allodermanyssus, *Dermanyssus*.

Entonyssinae — Chelae with or without teeth, pilus dentilis always absent. Palps 5- or 4-segmented. Dorsal plate relatively large, undivided. Tritosternum absent or only a short basal plate is left, which is never bifid. Sternal plate with or without a basal pair of setae. Anal plate with 3 setae. Peritreme developed or reduced, spiracle opens ventrally or ventro-laterally. — Endoparasitic in the respiratory system of reptiles. In the Ethiopian region, the following two genera have been found:

Hamertonia, *Mabuyonyssus*.

Rhinonyssinae — Chelae rarely with teeth, mostly bare, sometimes one chela reduced. Pilus dentilis absent. Palps 5- or 4-segmented. Dorsal plate reduced in size, often divided or split into several pieces. Tritosternum absent. Sternal plate mostly weakly sclerotized, sometimes completely indistinct, setae minute and mostly off the plate. Genital plate small, with one pair of setae or with none. Anal plate with 3 or 2 setae. Peritreme strongly reduced in size, sometimes wanting, spiracle situated dorsally or dorso-laterally. — Endoparasitic in the respiratory system of birds. The following genera have been recorded from the Ethiopian region:

Larinyssus, *Neonyssus*, *Ptilonyssus*, *Rallinyssus*, *Rhinoecius*, *Rhinonyssus*, *Sternostoma*.

Halarachninae — Chelae without teeth, one arm may be completely reduced. Pilus dentilis absent. Palps 5- or 4-segmented. Dorsal plate undivided, but subject to reduction. Tritosternum absent. Sternal plate mostly longer than broad and with 3 pairs of setae, rarely reduced in size and with fewer setae. Genital plate strongly reduced, weakly sclerotized and usually not detectable. Anal plate present, normally with 3 setae. Peritreme developed, but short and not extending beyond coxa III, spiracle opens ventrally. — Endoparasitic in the respiratory system of mammals. In the Ethiopian region, the following genera occur:

Orthohalarachne, *Pneumonyssoides*, *Pneumonyssus*, *Rhinophaga*.

2. *Laelaps echidninus* Hirst.

L. echidninus is a well known parasite of our domestic rats, *Rattus rattus* (Linné) and *Rattus norvegicus* (Erxleben), which have been distributed with their hosts almost all over the world. Like many species with wide ranges (comp. Jepsen, Mayr & Simpson, 1949), this mite is evidently highly variable and appears to have split into many populations, which show more or less pronounced morphological differences. These populations may give rise to fairly well limited subspecies, or they may even represent subspecies at present. It will, however, be necessary to examine an adequate series of material from all over the area of distribution, before any conclusions can be drawn.

Turk (1950), basing his conclusions on not very abundant material and on the old literature, has split *echidninus* auct. into two species, namely *L. echidninus* Berlese 1887, and *L. hirsti* Turk (= *echidninus* Hirst 1913, nec Berlese). He has also subdivided the former species into the subspecies *echidninus* s. str. and *vitzthumi* Turk and the latter into *hirsti* s. str., *pallidus* Tragardh 1931, and *ceylonicus* Turk. The main separating features which he used were the general body-size, the ratio of length and width of the sternal plate, arrangement of the sternal hairs and the size of the metasternal plates.

In the Ethiopian region *L. echidninus* is an introduced species and is not very common. We have only two series before us, one consisting of 28 ♂♂ and 27 ♀♀ from White Rats (Yaoundé, Cameroons), the other represented by 6 ♀♀ from *Rattus morio* Trouessart (Brazzaville, French Congo). The first series is similar to Turk's *echidninus* ssp. *vitzthumi*, but it does not completely agree with it and tends more towards his *hirsti*. The specimens from *Rattus morio* may be assigned to Turk's "typical" *echidninus* Berlese (nec Hirst).

On studying Turk's drawings of the typical *echidninus* and *hirsti*, one gets the impression that these represent two distinct species. However, when one starts to study Turk's subspecies, the separation of *echidninus* and *hirsti* becomes less clear and convincing. His drawing of the sternal plate of *echidninus* ssp. *vitzthumi* gives the impression that this form is more closely related to *hirsti* sensu Turk than to Berlese's *echidninus*.

We are of the opinion that Turk's study of the *echidninus*-complex was not based on a sufficiently wide range of material, and that the subdivision of this complex into species, or further into subspecies, will have to be reviewed again when more material from a sufficient number of hosts and localities becomes available. For the present we regard Turk's new names as questionable synonyms of Berlese's *echidninus*.

Should it be proved in the future that Turk's *hirsti* really represents a distinct species or subspecies, this name will have to be changed, because da Fonseca used the name *L. hirsti* in 1939 for a South American species.

3. *Laelaps muricola wittei* (Cooreman).

Cooreman (1955) received a series of mites (13 ♂♂, 34 ♀♀) collected from *Praomys tullbergi montis* Thomas & Wroughton (= *Rattus morio* Trouessart) caught at Kamatembe, Parc National Albert, which he identified, with the exception of one female, as "*Macrolaelaps muricola* (Tragardh)". For the single female specimen, characterized by a wider sternal plate and shorter and weaker hairs on the genital and anal plates, he created the subspecies *wittei* nov.

The drawing which Cooreman gives of *wittei* shows that this mite is quite outstanding. Since it was collected from the same host and locality, and on the same date as a series of typical *L. muricola*, it is unlikely that it represents a subspecies. The explanation may be either that it represents another

distinct species, or that it is a pathological specimen of *muricola*, in which case it would not earn a name.

As the name has already been created, we think it better to list *wittei* as a distinct species, although its status cannot be decided upon until more material becomes available. We feel, however, that it is inadvisable to base a new species on a single specimen, if there is the slightest possibility that the specimen is abnormal.

4. *Laelaps nuttalli* Hirst, *L. liberiensis* Hirst and *L. lamborni* Hirst.

Zumpt (1950) believed that *L. lamborni* might be a synonym of *L. nuttalli*. Keegan (1956), however, drew attention to several morphological features distinguishing these two species, but suggested that *L. lamborni* might be a synonym of *L. liberiensis*.

Re-examination of the material in our collection, and also of paratypes of *L. nuttalli* and *L. lamborni* which we received through the kindness of Dr. G. Owen Evans, British Museum, has led us to the conclusion that for the present all three species should be regarded as distinct. From various hosts, however, we have several series of mites which are closely allied to one or other of these three species, but their status can not be determined with certainty until more material has been examined. This may necessitate a revision of the opinion expressed in this paper.

The three species may be separated in the female sex according to the features given in the following key:

- 1 (2) Peritreme extends to a level above coxa I. Length to width ratio of sternal plate about 1:1.5. *L. nuttalli* Hirst.
- 2 (1) Peritreme extends to a level above coxa II. Length to width ratio of sternal plate approximately 1:1 3
- 3 (4) Greatest width of genital plate about twice its width at level of first pair of setae. Distance between 4th pair of genital setae about 1.4 times distance between 1st pair . . . *L. liberiensis* Hirst.
- 4 (3) Greatest width of genital plate about 1.5 times its width at level of 1st pair of setae. Distance between genital setae of 1st and 4th pairs approximately equal *L. lamborni* Hirst.

5. *Laelaps giganteus* Berlese and *L. bakeri* Hirst.

Hirst (1923) originally described *L. bakeri* as a distinct species. His type specimen was collected from an *Arvicanthis* spec., most probably *A. niloticus* Desmarest, caught at Soroti Teso, Uganda. In a later paper Hirst (1925) listed *bakeri* as a "var." of *giganteus*, evidently because he found in additional material that the features given by him for separating these two forms were not constant. Zumpt (1950) got the same impression when studying material from various South African localities, and he regarded *bakeri* as a questionable variety, "which may not even have subspecific status".

We have raised this question once more and have checked several series of mites of the *giganteus-bakeri* complex from different localities and hosts. The various plates of the body were carefully measured but without any satisfactory result. Some populations agree with Hirst's (1925) drawing of *giganteus*, and others with *bakeri*, except that in both cases the peritremes are a little shorter than indicated by Hirst, ending between the 1st and 2nd pairs of legs. There are also several populations which are intermediate between *giganteus* and *bakeri*. It has not been possible to detect a cline with *giganteus* at one geographical limit and *bakeri* at the other, as the populations with certain characteristic features appear to be distributed haphazardly.

It is possible that we are dealing with one species which has a high intraspecific variability, but the populations in different localities may have a restricted gene-flow, resulting in the development of more or less characteristic phenotypes, in each of which there is much less variation than in the species as a whole.

Whether a subdivision into subspecies is advisable will have to be decided at a later date, when more material is available. For the present we prefer to regard *bakeri* as a synonym of *giganteus*.

6. Genus *Eubrachylaelaps* Ewing.

This genus, erected by Ewing (1929) for *Laelaps hollisteri* Ewing, 1925, was placed into the synonymy of *Haemolaelaps* Berlese, 1910, by Zumpt & Patterson (1951). Furman (1955) restored the genus and separated it from *Haemolaelaps* mainly on account of the "elongate spine-like dorsal setae on the apices of the femora and bases of the genua of legs I and II". He included in it 8 species which are all restricted to the New World, and transferred *Eubrachylaelaps lophuromius* (Radford, 1939), described as *Cyclolaelaps* from Uganda, to *Haemolaelaps* s. str.

We have checked this feature in several Ethiopian species and have compared these species with some true *Eubrachylaelaps* which have been kindly sent to us by American authors. The conclusion we have reached is that the spinulation of the fore-legs does not allow a clear separation, but that there are intermediate forms in the Ethiopian region, for instance *H. murinus* Berlese (= *arvicanthis* Radford). We therefore think it more advisable to include the so-called *Eubrachylaelaps* species in the genus *Haemolaelaps* Berlese.

7. *Haemolaelaps spinatarsus* Berlese.

Major Keegan has been kind enough to send us copies of camera lucida tracings made by Dr. F. Gorirossi, of a specimen of *H. spinatarsus* Berlese (1918), from Berlese's collection in the Istituto Entomologia Agrari, Florence. This specimen was collected from a species of *Georychus* in Zululand, and according to Dr. Gorirossi's drawings it appears to be a synonym of *H. capensis* Hirst.

8. The genus *Liponyssus* auct.

The generic name *Liponyssus* has been used for a long time, until recently by some authors (e.g. Zumpt & Till, 1953), to designate a complex of gamasid mites infesting mammals and birds. Oudemans (1936) restricted the genus *Liponyssus* to include only the type species (*Dermanyssus setosus* Kolenati, 1857), and proposed the use of Kolenati's name *Macronyssus* (1858) for the other species which had previously been regarded as belonging to the genus *Liponyssus*. The type of *L. setosus* is probably lost, but the description and drawing given by Kolenati in 1859 leave no doubt that Oudemans' conclusion is correct.

Oudemans' restriction is regrettable in so far as the genus *Liponyssus* auct. contains several species of great economic importance which have already found their way into applied entomology and popular literature under the generic name *Liponyssus*. It would have been preferable, we believe, to put *Liponyssus* on the list of nomina conservanda with a type species which is clearly characterized — for instance the Tropical Rat Mite, *Macronyssus bacoti* (Hirst).

Furthermore, *L. setosus* (Kolenati) is so badly described and figured that it is impossible to refer it to any other known genus. It is evident, as pointed out above, that Kolenati's species does not belong to *Macronyssus* sensu Oudemans, but by now it has most probably been redescribed under another name and listed under one of the bat-infesting genera. We propose to regard *Liponyssus* (Kolenati originally wrote *Liponissus*) as a genus incertus.

Fonseca (1948) revised the genera related to *Macronyssus* and split this genus sensu Oudemans into several distinct genera, using partly generic names created by older authors. He characterized these genera by the density of the pilosity, by the shape of the female genital plate and its degree of sclerotization (with or without "scale-like markings"). He also used some features of the male sex, but the males of many species are not known.

Zumpt & Patterson (1951) have briefly discussed this classification and pointed out that the features used by Fonseca are variable and do not allow a clear separation, at least in the female sex on which the system is predominantly based, owing to the lack of males in many species. Several authors, especially in America, have continued to use Fonseca's classification. We have reconsidered this problem once more and come to the same conclusion as that drawn by Zumpt and Patterson. However, we accept the fact, as discussed above, that the name *Liponyssus* should be avoided, but we propose, as suggested by Oudemans, to use Kolenati's name *Macronyssus* (type species: *Macronyssus longimanus* Kolenati). This genus would then comprise the following synonymic genera:

Liponyssus auct. nec Kolenati 1858.

Ichoronyssus Kolenati 1858, *Wien. Ent. Monatsschr.* 2, p. 5. (type species: *Dermanissus scutatus* Kolenati).

Lepronyssus Kolenati 1858, id. *ibid.* (type species: *Lepronyssus leprosus* Kolenati).

- Leiognathus* Canestrini 1884, *Atti Ist. Veneto* (6) 2, p. 1573. (type species: *Dermanyssus sylviarum* Canestrini).
- Ornithonyssus* Sambon 1928, *Ann. Trop. Med. Parasit.* 22, p. 105. (type species: *Dermanyssus sylviarum* Canestrini).
- Bdellonyssus* Fonseca 1941, *Ciencia* 2, p. 262 (type species: *Leiognathus bacoti* Hirst).
- Chiroptonyssus* Augustson 1945, *Bull. Soc. Calif. Acad. Sci.* 44, p. 46. (type species: *Liponyssus robusticeps* Ewing).
- Fonsecaonyssus* Radford 1950, *Parasitol.* 40, p. 373 (type species: *Dermanyssus sylviarum* Canestrini).

9. *Macronyssus africanus* nom. nov.

Zumpt and Patterson (1951, p. 87) described a *Liponyssus rhinolophi* taken from *Rhinolophus clivosus* Cretzschmer (= *geoffroyi* A. Smith), Transvaal, being unaware that this name was preoccupied by *Liponyssus rhinolophi* Oudemans (1901) collected from *Rhinolophus ferrum-equinum* Schreber, Italy. We propose the name *Macronyssus africanus* for the African species.

10. *Manitherionyssus heterotarsus* Vitzthum.

Vitzthum (1924) described this species from specimens found on a Cape Pangolin (*Manis temmincki* Smuts), at Grootfontein in South West Africa. Unaware of Vitzthum's publication, Lawrence (1939) later described *Manisicola africana*, a mite parasitic on the same species of pangolin. Fonseca (1948) stated that the two genera were synonymous, but up to now all authors, including Zumpt and Patterson (1951), have hesitated to unite the two species, because of certain contradictions in the descriptions.

The type specimens of *M. heterotarsus* are not obtainable, but we have carefully checked paratypes of Lawrence's species and additional material which we have received from the same host, and have come to the conclusion that both descriptions refer to the same species, and that the contradictions are due partly to an intraspecific variability and partly to errors in interpretation.

11. *Spinturnix kenyaensis* Radford and *Spinturnix lateralis* (Kolenati).

Zumpt (1951) suggested that *S. kenyaensis* Radford, described from the Straw-coloured Fruit-Bat (*Eidolon helvum*) in Kenya, was a synonym of *S. lateralis* (Kolenati), a parasite of the Egyptian Fruit-Bat (*Rousettus aegyptiacus*) from the Mediterranean subregion.

We have re-examined material of *S. kenyaensis* and Hirst's (1923) drawings of *S. lateralis*, but unfortunately have not been able to see any specimens of the latter species. Hirst only shows the ventral surface of the male and female so that we are unable to comment on any of the dorsal features. Although the females are similar in the general appearance, the males of the two species differ from one another, particularly in respect of

the structure and chaetotaxy of the first pair of legs. It seems clear therefore, that *S. kenyaensis* and *S. lateralis* should be regarded as distinct species.

12. The position of the genus *Myonyssoides* Hirst.

Hirst (1925), when basing this genus on *Myonyssoides capensis* Hirst, suggested a relationship to *Myonyssus* Tiraboschi. This suggestion is certainly not convincing. In the females of *Myonyssus*, there is a genital-ventral plate with more than 2 bristles, the anal plate has "typically only three setae" (comp. Furman and Tipton, 1955), the chelae are tooth-less and without a pilus dentilis, and the sternal plate is provided with 3 pairs of bristles. Furman and Tipton therefore placed *Myonyssus* into the Dermanyssidae. According to the present paper it would belong to the Macronyssinae. The genus *Myonyssoides*, however, has a simple genital plate with only one pair of bristles, whereas the ventral and the anal plates are united to form a ventral-anal plate, which is provided with a great number of setae. In the type species the sternal plate includes the metasternal area and shows 4 pairs of bristles, whereas in *M. spinosus* de Meillon and Lavoipierre it has the usual 3 pairs of bristles. The movable chela is denticulated and the fixed one is provided with a broad pilus dentilis.

In the Laelaptidae, as defined in this paper, there is no tendency towards the union of the anal and the ventral plates, but in the primitive forms, a genital-ventral plate is present, which is gradually reduced in the more highly specialized parasitic genera. This feature alone should be sufficient to exclude the genus *Myonyssoides* from the Laelaptidae.

It is not easy to decide into which of the known families of Gamasides the genus *Myonyssoides* should be placed instead. Baker and Wharton (1952) have given a key to the genera of Gamasides, in which one of the main features used is the condition of the dorsal shield, i.e. whether it is entire or whether divided into two subequal plates. This feature is certainly not a family character. We find in the Laelaptidae s. lat. all kinds of modifications of the dorsal shield, from a complete, broad plate to more or less reduced ones, from those which are split into two subequal plates to those in which the posterior is much smaller than the anterior one.

If this feature is disregarded, the genus *Myonyssoides* could find a place in the family Ascaidae. Of this family we have only seen the Palearctic species *Asca aphidioides* (L.), of which two female specimens were lent to us by the British Museum. Its ventral sclerotization is almost identical with that of *Myonyssoides capensis* Hirst. It differs from *M. capensis* in having a divided dorsal plate, feathered dorsal hairs, and chelae which are toothed but without a pilus dentilis. The presence or absence of a pilus dentilis is also not a family character, and the feathering of the dorsal hairs has never been regarded as a feature of great taxonomic importance. On the other hand, the palpal tarsus shows a bifurcate seta in *Myonyssoides* as well as in *Asca*.

The higher classification of the Gamasides needs to be revised critically, and it is quite possible that further studies will reveal, as Oudemans (1939)

and later Vitzthum (1943) suggested, that the family Ascaidae should be dissolved and its genera distributed to other groups. Such a revision can only be done by someone who has a great knowledge of the free-living gamasid mites; these have never been studied by the authors of this paper. Until this has been done, we propose to list the genus *Myonyssoides* in the family Ascaidae.

REFERENCES.

- BAKER, E. W. & WHARTON, G. W., (1952) An introduction to acarology. — The MacMillan Company, New York, 465 pp.
- BERLESE, A., (1918) Centuria quarta di acari nuovi. — *Redia* 13, 115.
- COOREMAN, J., (1955) Acari. — *Expl. Parc. Nat. Albert*, Mission G. F. de Witte 1933-1935, fasc. 85, 43 pp.
- EVANS, G. O., (1955) A review of the laelaptid paraphages of the Myriapoda with descriptions of three new species (Acarina: Laelaptidae). — *Parasitology* 45, 352.
- EWING, H. E., (1929) A manual of external parasites. — Baillière, Tindall & Cox, London, 225 pp.
- FAIN, A., (1957) Essai de classification des Rhinonyssidae (Acari: Mesostigmata) avec description de deux genres nouveaux. — *Ann. Parasit. hum. comp.* 31, 145.
- FONSECA, F. da, (1948) A monograph of the genera and species of Macronyssidae Oudemans, 1936 (synonym: Liponyssidae Vitzthum, 1931) (Acari). — *Proc. zool. Soc. Lond.* 118, 249.
- FURMAN, D. P. & TIPTON, V. J., (1955) The genus *Myonyssus* Tiraboschi (Acarina: Dermanyssidae) including a new species from Pika. — *J. Parasit.* 41, 179.
- FURMAN, D. P., (1955) Revision of the genus *Eubrachylaelaps* (Acarina: Laelaptidae) with the descriptions of two new species from Mexico. — *Ann. ent. Soc. America* 48, 51.
- HIRST, S., (1923) On some new or little known species of Acari. — *Proc. zool. Soc. Lond.* 1923, 971.
- (1923) On three new species of Laelaps occurring on African rodents. — *Ann. Mag. N. H.* 12, (9) 690.
- (1925) Descriptions of new acari, mainly parasitic on rodents. — *Proc. zool. Soc. Lond.* 1925, 49.
- JEPSEN, G. L., MAYR, E. & SIMPSON, G. G., (1949) Genetics, palaeontology and evolution. — Princeton University Press, New Jersey, 474 pp.
- KEEGAN, H. L., (1956) Ectoparasitic laelaptid and dermanyssid mites of Egypt, Kenya and the Sudan, primarily based on Namru 3 collections, 1948-1953. — *J. Egypt. publ. Health Ass.* 31, 199.
- LAWRENCE, R. F., (1939) A new mite from the South African pangolin. — *Parasitology* 31, 451.
- OUDEMANS, A., (1901) Notes on Acari. Third series. — *Tijdschr. Nederl. Dierk. Ver. Ser. 2*, 7, 50.
- (1936) Kritisch historisch overzicht der Acarologie. 3 A. — Leiden, 430 pp.
- RADFORD, C. D., (1939) Notes on some new species of parasitic mites. — *Parasitology* 31, 243.

- TURK, F. A., (1950) Studies of Acari. VI. Parasitic mites from mammalian hosts obtained in Ceylon. — *Parasitology* **40**, 63.
- VITZTHUM, H., (1924) Acarologische Beobachtungen. 8. Reihe. — *Arch. Naturg.* (A) **90** pt.10, 1.
- (1943) Acarina. — Bronns Klassen u. Ordnungen d. Tierreiches 5 (IV), 1011 pp.
- ZUMPT, F., (1950) Descriptions of two new Laelaps species from South Africa with a key to the Ethiopian species of this genus (Acarina, Laelaptidae). — *S. Afr. J. med. Sci.* **15**, 77.
- ZUMPT, F., & PATTERSON, P. M., (1951) Further notes on laelaptid mites parasitic on vertebrates. A preliminary study to the Ethiopian fauna. — *J. ent. Soc. S. Afr.* **14**, 63.
- ZUMPT, F., & TILL, W., (1953) The genus *Liponyssus* Kolenati in the Ethiopian region (Acarina: Laelaptidae). — *S. Afr. J. med. Sci.* **18**, 5.

ADDENDUM.

While this paper was in press, two publications appeared which have a bearing on the subject under discussion. We wish to review these papers briefly and to add the corrections which we consider necessary and which we intend to adopt in the proposed check-list.

a) *Zygotaelaps* Tipton.

Tipton (1957) described a new mite from a Madagascan tenrec (*Nesogale dobsoni*), for which he erected the genus *Zygotaelaps*. He compares this genus with *Gigantaelaps* Fonseca, *Eubrachylaelaps* Ewing and *Haemolaelaps* Berlese. As discussed under No. 6, we are of the opinion that *Eubrachylaelaps* should not be kept as a distinct genus. The reasons given also apply to *Zygotaelaps*. The table compiled by Tipton reveals that the features used by him to separate *Zygotaelaps* from *Haemolaelaps* have no great phylogenetic value. We therefore regard *Zygotaelaps*, like *Eubrachylaelaps*, as a synonym of *Haemolaelaps*.

The American genus *Gigantaelaps*, however, is regarded by us too as a distinct genus, mainly on account of the characteristic armature of the second coxa in combination with the large, lanceolate tectum.

b) The genera *Ixodorhynchus* Ewing, *Hemilaelaps* Ewing and *Ophidilaelaps* Radford.

Tibbetts and Strandtmann (1957) discussed the snake-infesting genus *Ixodorhynchus* Ewing and placed into its synonymy the genera *Ixobioides* Fonseca, *Hemilaelaps* Ewing, *Ellsworthia* Turk and *Ophidilaelaps* Radford.

It is generally accepted that *Ixodorhynchus* and *Ixobioides* are congeneric. The two species [*I. liponyssoides* Ewing and *I. butantanensis* (Fonseca)] described up to now are characterized in the female sex by a divided dorsal plate and by the peculiar structure of the gnathosoma. The chelicerae are unidigitate, the fixed digit being totally reduced. Other authors, for instance Fonseca (1934) and Vitzthum (1943), have regarded this feature as sufficiently important to justify the placing of this genus into a distinct family. This step

is debatable, but there may be justification for leaving *Ixodorhynchus* in a separate subfamily of the Laelaptidae s. lat.

The two species of *Ixodorhynchus* listed above belong to the New World. Tibbetts, in Tibbetts and Strandtmann (1957), described a further unidigitate species from the Far East, the female of which has an undivided dorsal plate and thick dorsal hairs. There are also other features which would probably justify the generic separation of this species from *Ixodorhynchus*.

The genus *Hemilaelaps* Ewing contains at present two American species. Turk (1945) considered this name to be invalid and proposed the substitution of the new name *Ellsworthia*. Strandtmann and Tibbetts (1957) do not accept this replacement and use the name *Hemilaelaps*. We are not able to settle this question, but we do not support these two authors in the relegation of *Hemilaelaps* to the synonymy of *Ixodorhynchus*. *Hemilaelaps* is known to us only from Ewing's (1933) diagnosis, but the bidigitate chelicerae which have toothed chelae but no "fanglike setae" on the fixed arm should alone be sufficient to separate it from *Ixodorhynchus*.

Finally, *Ophidilaelaps* is characterized by toothed chelae with a typical pilus dentilis, and by bifid spines on the posterior part of coxae I to III. Tibbetts and Strandtmann do not regard these as being of generic value, but if this opinion were accepted many of the laelaptid genera recognized by present authors would have to be "lumped". *Ophidilaelaps* is distributed over the Ethiopian and Palaearctic regions. This genus, which up to now contains five species, has been revised by Till (1957).

ADDITIONAL REFERENCES.

- EWING, H. E. (1933). New genera and species of parasitic mites of the superfamily Parasitoidea. — *Proc. U.S. Nat. Mus.*, **82**, 1.
- FONSECA, F. DA (1934). Der Schlangenparasit *Ixobioides butantanensis* Novi Generis n.sp. (Acarina, Ixodorhynchidae Nov. Fam.). — *Z. Parasitenk.* **6**, 508.
- TIBBETTS, T. and STRANDTMANN, R. W. (1957). The snake mite parasites of the family Ixodorhynchidae (Mesostigmata), with description of a new species, *Ixodorhynchus gordonii*. — *Proc. Ent. Soc. Wash.* **59**, 265.
- TILL, W. M. (1957). Mesostigmatic mites living as parasites of reptiles in the Ethiopian region (Acarina: Laelaptidae). — *J. ent. Soc. S. Afr.* **20**, 120.
- TIPTON, V. J. (1957). *Zygodaelaps madagascariensis* (Acari: Laelaptidae). A new genus of mites from Madagascar. — *J. Parasitol.* **43**, 367.
- TURK, F. A. (1945). Studies of Acari. Second Series: Description of a new species and notes on established forms of parasitic mites. — *Parasitology* **36**, 133.